NASA EXPLORER SCHOOLS

Administered by the National Science Teachers Association (NSTA)
and Oklahoma State University (OSU)
Type of Agreement: Grant (NSTA) and Cooperative Agreement (OSU)

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PROJECT DESCRIPTION

The NASA Explorer Schools (NES) Project establishes a 3-year partnership between NASA and school teams consisting of teachers and education administrators from diverse communities across the country. The NES Project works primarily with groups of students who are underrepresented in science, technology, engineering, and math (STEM) professions or who are traditionally underserved by NASA in rural or urban parts of the country. NES joins educators, students, and families in sustained involvement with NASA's research, discoveries, and missions. The Project is designed for education communities at the 4-9 grade levels to help middle schools improve teaching and learning in STEM through significant structural techniques such as professional development, stipends, grants, curricular support based on NASA's resources, and the innovative use of instructional technology provided primary by the NASA Digital Learning Network (DLN). NES provides a comprehensive middle-level project to students and teachers at the critical age of decision-making for NASA's education pipeline.

PROJECT GOALS

NES expands horizons – opening young minds to the possibilities of what the future holds. NES strives to make the resources, experiences, and tools necessary for effective science and mathematics education available to schools nationwide. The NES project links educators and students to resources and facilities that are normally beyond reach in the public school system. This direct contact plays an integral role in impacting individual students and entire school communities.

The goals for NES are as follows:

Project Goal 1: Provide educators with sustained professional development.

Project Performance Objectives:

- Increase the active participation and professional growth of educators in science.
- Increase the academic assistance for and technology use by educators in schools with high populations of under-served students.

Project Goal 2: Provide all students the opportunity to explore STEM topics in a variety of engaging and interactive NASA contexts.

Project Performance Objectives:

- Increase student interest and participation in mathematics, science, technology and geography.
- Increase student knowledge about careers in mathematics, science, engineering and technology.
- Increase student ability to apply mathematics, science, technology, and geography concepts and skills in meaningful ways.

Project Goal 3: Build strong family involvement within NES schools.

Project Performance Objectives:

- Increase family involvement in children's learning.

PROJECT BENEFITS TO OUTCOME 2

Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers and faculty.

The goals of the NES Project align to Outcome 2 of the 2006 NASA Education Strategic Coordination Framework (http://education.nasa.gov/about/strategy/) which works to "attract and retain students in STEM disciplines." NES works to effectively compete for the minds, imaginations and career ambitions of America's young people.

NES primarily reaches students by engaging teams of teachers and administrators at partner schools. The project provides teachers with unprecedented access to NASA's unique mission content, resources, and technology. During 1-week professional development workshops at NASA Centers, educators gain first-hand knowledge of NASA research, facilities and educational resources. Customized professional development opportunities are offered throughout the 3-year partnership by NES Coordinators during on-site visits and through e-Professional Development opportunities that utilize on-line collaborative software and Web cast technologies.

909 educators participated in either short-duration (2 days or less) or long-duration (more than two days) NES STEM professional development opportunities in FY09. Among those who attended professional development, 73.7% used at least one NASA resource in their classrooms. 98% of NES professional development participants reported that the NASA STEM resources were effective in teaching STEM concepts. (Data Source: Year-end Teacher Involvement Survey, administered May 2009; Reported in Paragon TEC, Inc., September 2009).

The NES Project focuses its efforts on engaging and retaining students in STEM education and encourages them to pursue educational disciplines that are critical to NASA's future engineering, scientific, and technical missions. 85,004 unique students participated in NASA instructional and enrichment activities. Students in grades 4-12 reported statistically significant increases in interest in science, math and technology following participation in NES. (Paragon TEC, Inc., September 2009). 72.2% of NES students reported that they were interested in learning more about STEM content after

participating in NASA educational activities. (Data Source: Year-end Student Interest Survey, administered May 2009).

As a result of participation in NES, students are exposed to career related activities throughout the K-12 pipeline. NES reported completing 530 student activities about STEM careers reaching 40,566 student participants[1] during the 2008-2009 school year. (Data Source: NES Site Status Reporting System). 98% of NES team lead educators reported they believed NES increased student participation in STEM and 92% reported that they believed NES increased the amount of STEM career information that students received. (Data Source: Year-end NES Team Lead Survey, administered May 2009; Reported in the End of Year Report, Paragon TEC, Inc., August 2009) 72.1% of NES students reported that they would rather use NASA resources to learn STEM concepts and 62.8% reported that it is easier to learn and they learn more using NASA resources. (Data Source: Year-end Student Interest Survey; Reported in the NES Annual Report, Paragon TEC, Inc., September 2009)

PROJECT ACCOMPLISHMENTS

FY09 NES Partner School Accomplishments:

Since the inception of the project in 2003, NASA has established 200 NES partnerships, representing a total of 249 schools from diverse communities located in all 50 States, Washington D.C., Puerto Rico and the Virgin Islands. In FY09, NASA provided professional development and student programs to 63 schools in their second or third year[2] of the 3-year NES partnership with NASA. Additionally, 83 alumni NES, who have completed the initial 3-year partnership, actively participated in NES professional development and student opportunities. 69.2% of the 146 NES served in FY09 are considered high poverty and 76.7% serve high minority student populations. (Data Source: The National Center for Educational Statistics – School Enrollment Database, http://nces.ed.gov).

NES provided 1,844 total professional development opportunities, student learning activities, and family involvement events in FY09, reaching a total of 200,874 educator, student, family and community member participants.[3] (Data Source: NES Site Status Reporting System).

In FY09, NES Coordinators conducted 175 site visits to NES, directly engaging 26,796 students, educators, family members and community members in NASA educational activities. During site visits, NES Coordinators met with NES team members to develop the school's strategic action plan for enhancing STEM teaching and learning within their school. While at the schools, coordinators also provided professional development for educators, led hands-on NASA educational activities for students, and provided family night activities.

[1] Total number of participants does not represent unique students. Individuals may have participated in multiple NES career events throughout the school year.

[2] The NES Project did not select a new cohort of schools in 2008 and 2009 therefore there were no schools in their first year of the NES partnership.

[3] Total number of participants does not represent unique individuals. Individuals may have participated in multiple NES events throughout the school year.

FY09 NES Educator Accomplishments:

NES provided a total of 189 short-duration and long-duration professional development opportunities reaching 3,793 educator participants[4]. Professional development was provided during one-week STEM workshops at NASA Centers, on-site training at schools, and follow-up educational advisory sessions with NES staff. 89 educators participated in 4 long-duration (one week) NES STEM content workshops held at NASA Centers June – July 2009. NES also provided three special opportunity workshops for educators during the 2008-2009 school year that provided participants first-hand experience conducting STEM experiments in field settings and provided assistance in translating the research into classroom activities for their students. 17 educators participated in the *Winter's Story Workshop,* held at Yellowstone National Park, 9 educators participated in the *Moon, Mars and Earth Workshop,* held at Arizona State University – Meteorite Facility and Lunar Reconnaissance Orbiter Operation Center, and 40 educators participated in the *Reduced Gravity Flight Opportunity,* held at Johnson Space Center

Participants were highly satisfied with their experiences at NES workshops. 97.4% either agreed or strongly agreed that the workshop had inspired them to bring NASA content into their classroom and 94.2% either agreed or strongly agreed that they could immediately apply information or activities learned during the workshop. 89.7% either agreed or strongly agreed that they will be more effective in teaching STEM concepts introduced in the workshop. (Data Source: Educator Professional End of Event Survey; Reported in the NES Mid-Year Report, Paragon TEC, Inc., April 2009 and the NES End of Year Report, Paragon TEC, Inc., August 2009).

FY09 NES Student Accomplishments:

NES provided 1,649 student learning opportunities engaging 135,888 student participants[5] in FY09. Students learning opportunities involve content-specific activities that use NASA missions as a context to enhance a school's curricula by adding real world applications and relevance. Typically done with teacher support and training, these project elements offer direct uses of NASA mission data to solve investigative questions through hands-on activities.

62 students representing 31schools participated in the NES National Student Symposium, held at Johnson Space Center, in May 2009. Students presented the results of their research investigations focused on a wide-range of NASA missions or research interests, including science, aerospace, reduced gravity, robotics, plant growth in space, or living and working in space. Regional virtual symposia were held in February and March at all 10 NASA centers using NASA's Digital Learning Network. The regional symposia challenged students to present their research projects to a panel of NASA experts via videoconferencing. Schools then competitively selected students to represent their school at the national symposium based upon the results of the regional symposia.

[4] Total number of participants does not represent unique educators. Individuals may have participated in multiple professional development opportunities throughout the school year.

[5] Total number of participants does not represent unique students. Individuals may have participated in multiple NES career events throughout the school year.

Overall, the NES National Student Symposium was a powerful, meaningful, purposeful, life enhancing experience for the students as evidenced by their own words during individual interviews conducted by the NES project evaluation team. (Paragon TEC, Inc., August 2009). NES was designed to increase student knowledge and interest in STEM and NASA. The student symposium interview summary revealed that the program is a powerful interest generator among its participants. Both students and entire schools are getting caught-up in what one teacher called, "NASA fever." Additionally, teachers reported the experience provided them with ideas for encouraging student exploration, discussion and participation as well as effective resources, ideas and activities for family involvement in STEM education. (Paragon TEC, Inc., August 2009)

PROJECT CONTRIBUTIONS TO PART MEASURES

PART MEASURE – Educator Professional Development (Short-duration): *Percentage of elementary and secondary educators who obtain NASA content-based education resources or participate in short-duration NASA education activities and use NASA resources in their classroom instruction.*

635 unique teachers participated in NES short-duration (two days or less) professional development opportunities in FY09. 65.0% (413/635) of the teachers who attended short-duration professional development used at least one NASA STEM resource in their classroom instruction. (Data Source: NES Year-end Teacher Involvement Survey, administered May, 2009; Results reported in the NES Annual Report, Paragon TEC, Inc., September, 2009)

PART MEASURE – Educator Professional Development (Long-duration): *Percentage of elementary and secondary educators who participate in NASA training programs and use NASA resources in their classroom instruction.*

274 unique teachers participated in NES long-duration (more than two days) professional development opportunities in 2009. 93.8% (257/274) of the teachers who attended long-duration professional development used at least one NASA STEM resource in their classroom instruction. (Data Source: NES Year-end Teacher Involvement Survey, administered May, 2009; Results reported in the NES Annual Report, Paragon TEC, Inc., September, 2009). Teachers who attended long-duration professional development were 28.8% more likely to have used at least one NASA STEM resource in their classroom, compared to teachers who had participated in short-duration professional development.

PART MEASURE – Student Involvement: *Number of elementary and secondary student participants in NASA instructional and enrichment activities.*

85,004 unique students from 146 schools located throughout the country, participated in NES instructional and enrichment activities in 2009. (Data Source: The National Center for Educational Statistics – School Enrollment Database, nces.ed.gov).

PART MEASURE – Student STEM Career Interest: *Percentage of students expressing interest in science, technology, engineering, and math (STEM) careers following their involvement in NASA elementary and secondary education programs.*

77.4% (4017/5189) of NES students reported that they were interested in a career that involves science, technology, engineering or mathematics. (Data Source: Year-end Student Interest Survey, administered May 2009; Results reported in the NES Annual Report, Paragon TEC, Inc., September, 2009).

PART MEASURE - *Cost per participant for NASA elementary and secondary education programs*

85,004 unique students and 3,442 unique educators participated in NES educational programs in FY09. The cost per participant was $51.72.

IMPROVEMENTS MADE IN THE PAST YEAR

In 2008, NES began an extensive internal and external review of the project goals, model, implementation and results. The process was initiated as a result of the recommendations received from The National Research Council of The National Academy of Science's external evaluation of NASA's Elementary and Secondary Education Program (Quinn, Schweingruber, and Feder, 2007). In 2009, NES continued to refine and retool the NES model through external focus groups. NES also conducted an external review of the historic NES model (Booz Allen Hamilton, July 2009) and completed a benchmarking review of high school best practices (Booz Allen Hamilton, August 2009).

PROJECT PARTNERS AND ROLE OF PARTNERS IN PROJECT

External Education Partner – National Science Teachers Association (NSTA), Grant number NNX07AU68G

NSTA provided project management and logistical support for the NES project in FY09. As an external education partner in the NES project, NSTA provided key support services including:

- Database maintenance, documentation and communications,
- Administration of NES technology grants and educator stipends,
- Promotional support and products,
- Logistical support for summer workshops, special opportunity workshops and the student symposium, and
- Design, delivery, and logistical support for external and user focus groups for the development of the new NES model.

External Education Partner – Oklahoma State University (OSU), Cooperative Agreement number NNX07AV66A

OSU provided a highly trained professional staff including NES Coordinators and Project Assistants who are fully engaged in NASA content to provide needs based services to schools since the project inception in 2003. NES Coordinators are the primary interface between NASA and NES Sites. Working with the Center NES Project Manger, the NES Coordinator is responsible for day-to-day project operations, implementation and communications. The NES Coordinators assisted NES teams in their region develop action plans for reaching school STEM improvement goals, and monitored the progress of NES teams as they implement their action plans. NES Project Assistants worked in collaboration with NES Coordinators to ensure completion of project requirements by maintaining project records, tracking key documents, and assisting NES team members access online systems.

OSU also provided project management support and implementation services including:

- Assistance in development and implementation of NES strategic action plans for enhancing STEM teaching and learning at NES Sites,
- Needs-based professional development and student programs to NES,
- Support of integration of NASA educational resources and educational technology tools at NES, and
- Support for the development of additional partnerships to enable project sustainability beyond the 3-year NES partnership with NASA.

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